IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

BARKAN WIRELESS IP HOLDINGS, L.P., Plaintiff,	CIVIL ACTION NO. 2:18-CV-28-JRG
v.	JURY TRIAL DEMANDED
SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC., VERIZON COMMUNICATIONS, INC. and CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS, Defendants.	

DECLARATION OF MARK LANNING IN SUPPORT OF
DEFENDANTS' RESPONSIVE CLAIM CONSTRUCTION BRIEF

I, Mark Lanning, declare as follows:

1. I have been asked by counsel for Defendants Samsung Electronics Co., Ltd., Samsung Electronics America, Inc. and Cellco Partnership d/b/a Verizon Wireless (collectively, "Defendants") to provide my opinions regarding the meaning of certain claim terms of U.S. Patent Nos. 8,014,284 (the "'284 patent"), 8,559,312 (the "'312 patent) and 9,392,638 (the "'638 patent") (collectively, the "Asserted Patents" or "Patents-in-Suit"). Specifically, I have been asked to provide my opinions on how a person of ordinary skill in the art at the time of the alleged invention of the Asserted Patents (a "POSITA") would have interpreted certain terms in the claims of the Asserted Patents.

2. I am being compensated at my customary rate of $550 per hour for the time I spend on this matter. My compensation in no way depends on my opinions or the outcome of the litigation.

3. In preparing this declaration, I reviewed the Asserted Patents, and their prosecution histories; dictionary definitions; Plaintiff's Opening Claim Construction Brief ("Pl. Br.") and the exhibits cited therein; Defendants' Technology Tutorial (slides and video); Plaintiff's Technology Tutorial (slides and video); and all other documents cited in this declaration. My opinions expressed in this declaration are based on my review of these materials, and are based on my education, training, research, personal experience, professional experience, industry experience, and specific knowledge of the underlying technologies.

4. In this declaration, I refer to exhibits cited in Plaintiff's or Defendants' claim construction briefs by the same letters and numbers used in those briefs, and I refer to documents not referenced in those briefs with new sequential exhibit numbers following the highest exhibit number used in Defendants' claim construction brief.

I. QUALIFICATIONS

5. Attached as Exhibit 13 is my *curriculum vitae*, which includes a more detailed statement of my professional qualifications, including education, publications, honors and awards, professional activities, consulting engagements, and other relevant experience. Below is a brief summary of relevant portions of Exhibit 13.

6. Since starting I.N. Solutions in 1991, I have worked with Motorola, Sprint, and Nextel to roll out some of the most successful telecom applications and network expansions worldwide. I was directly involved in the design of Sprint's Common Channel Signaling System 7 (SS7) network and the design and rollout of its FON (calling card) and 800 number services.

7. Starting in 1991, I was responsible for large development and network architecture projects with a budget in excess of $100 million each. Two of these projects were for British Telecom's cellular network division called Cellnet. The initial project, ACN, was an on-line transaction processing (OLTP) system responsible for real-time dialed digit translation for every phone call in the Cellnet network. The second project replaced Cellnet's batch-oriented billing system with a distributed real-time call detail record collection and on-demand rating and billing system. Both of these systems required custom development for a majority of the software that was done by different companies located across multiple countries and continents. The ACN project lasted about four years and involved over 100 software development personnel located in Texas, Nebraska, California, Sweden, Spain, Finland and England. The billing system project lasted more than three years and required over 600 developers at its peak that were located in England, Colorado, Texas and Sweden. Both of these systems were 24x7 mission critical to completing wireless calls and billing.

8. Starting in 1998, I and others at my consulting firm Telecom Architects were contracted by Nextel to design their 2.5G cellular iDEN switching, VoIP dispatch network, and its TDM/SONET transmission networks. After completion of the 2.5G network design, I and the

Telecom Architects team performed a large part of the qualification, testing and rollout phases for new equipment suppliers and their applicable products into Nextel's network.

9. I have also been intimately involved with the design, analysis and/or network implementation of many different PSTN and cellular network elements including at least: MSC, VLR, HLR, BSC, BTS, SMSC, MMSC, GGSN/SGSN, eNodeB, and RNC.

10. I have also served as an expert witness in many cases involving cellular and networking technology, including several cases in the Eastern District of Texas.

II. LEGAL STANDARDS

11. I understand from Defendants' counsel that claim terms are generally interpreted in accordance with the customary meaning they would have to a POSITA at the time of the alleged invention of the Asserted Patents. I also understand from Defendants' counsel that a POSITA would read the claim term in the context of the claims as well as the entire patent, including the patent specification and figures. I also understand from Defendants' counsel that it is appropriate to look to the record of a patentee's communications with the patent office during prosecution and reexamination to understand the claim terms.

12. I understand from Defendants' counsel that one can also consult extrinsic sources, such as dictionaries, prior art, and treatises, that shed light on the proper meaning of a particular claim term.

13. I also understand from Defendants' counsel that two instances where a claim term is given a different meaning than it otherwise would have are (1) when a patentee sets out a definition and acts as his own lexicographer, and (2) when the patentee disavows the scope of a claim term either in the specification or during prosecution or reexamination proceedings.

14. I further understand from Defendants' counsel that a claim is indefinite if the claim, when read in light of the specification, fails to inform a POSITA with reasonable certainty

as to the scope of the invention. I also understand from Defendants' counsel that a claim term involving a term of degree or a relative term may be indefinite if the claim term fails to provide objective boundaries to a POSITA, when read in light of the specification and the prosecution history.

III. PERSON OF ORDINARY SKILL IN THE ART

15. A POSITA at the time of the alleged invention of the Asserted Patents would have a Bachelor's or Master's degree in computer science, electrical engineering, or a related field, with at least three years of experience in the telecommunications field. Additional experience could substitute for the advanced degree, and significant experience in the field could substitute for formal education.

IV. OPINIONS

A. "packet-based data network" ('284 claims 1-4, 10-11, 18-19; '312 claims 1-2, 4, 8, 14-15, 22-25, 38-41)

Defendants	Plaintiff
network carrying groups of data, control, error control, and sequence information arranged in a specific format suitable for transmission across the network, including but not limited to an IP network or the Internet.	an IP network, such as the Internet, used to transfer packets of data between a sender and a recipient

16. "Packet" is a term of art in the communications field. Defendants' construction, taken from the Hargrave's Communications Dictionary (Ex. J at 380) definition of packet, accurately represents the understanding of a POSITA as to what a packet is.

17. On page 5 of Plaintiff's Opening Claim Construction Brief, Plaintiff states that Defendants' proposed construction for "packet-based data network" is inconsistent with the intrinsic evidence because it "seeks to add a mish-mash of unrelated limitations to the network," including "carrying groups of data," a "specific format" for transmitting data, and "control, error control and sequence information." I find this criticism curious because all of these limitations,

in addition to many others, are required by Plaintiff's proposed construction because that construction is limited to an IP network and an IP network requires all of these limitations.

18. "IP" is the acronym for Internet Protocol. Under the Internet Protocol, data is divided into packets that have a specific format with control and user data portions as defined by the rules of the Internet Protocol. There are different versions of the Internet Protocol, but the version that was by far most commonly used at the time of the Barkan patents was version 4 (IPv4).

19. The specific format of an IPv4 data packet is shown below:

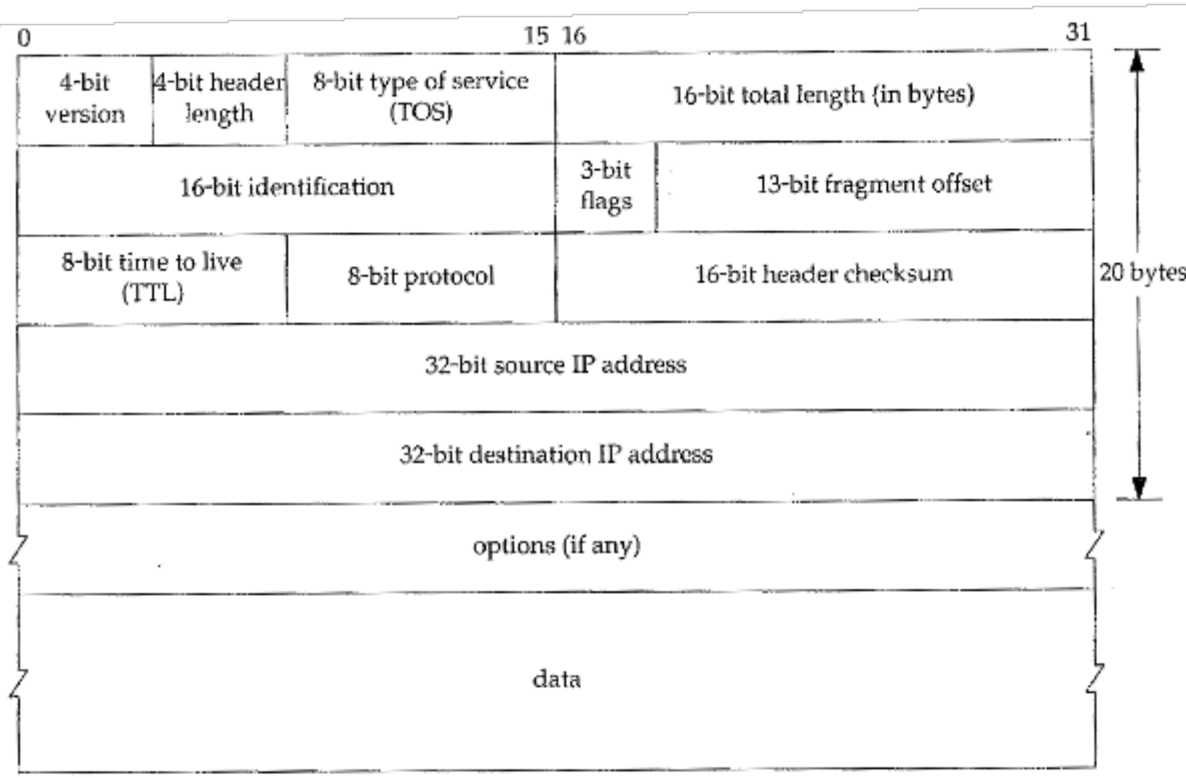


Figure 3.1 IP datagram, showing the fields in the IP header.

Ex. 14 (Stevens) at 34.

20. The first part of the packet is known as the header. In IPv4, the header normally consists of 20 bytes with various fields as shown in the figure above. The header can be larger if

certain optional information is present, but the maximum header length is 60 bytes. Ex. 14 (Stevens) at 34.

21. One of the fields in the header is labeled as "16-bit header checksum." This field is a checksum for the header. Ex. 14 (Stevens) at 36. A checksum is used to detect errors. *Id.* at 36-37. Thus, this field is an error control field.

22. Another of the fields in the IPv4 header is labeled as "8 bit time to live (TTL)." This field is an upper limit on the number of routers through which a packet may pass. Ex. 14 (Stevens) at 36. This field is included in the IP header because routing errors known as routing loops (in which a packet is passed in a loop between three or more routers rather than being forwarded to a final destination, and this field ensures that a packet caught in such a routing loop does not loop forever. This field is therefore a control field.

23. A third field in the IPv4 header is the "13 bit fragment offset" field. It is possible that a message (user data) to be transmitted is larger than the amount that can be included in a single packet. Ex. 14 (Stevens) at 148. When this occurs, the data is fragmented into two or more packets. *Id.* at 148. Each packet includes a fragment of the message, and the "13 bit fragment offset" field contains the offset, in 8-byte units, of the fragment in the packet from the beginning of the original message. *Id.* at 149. Thus, the "13 bit fragment offset" field contains sequence information as it allows the determination of where in a multi-packet sequence that together represent the entire message a particular packet belongs.

24. There are yet other fields in the header of an IP packet, including destination and source address fields, type of service fields, etc.

25. There are similar fields in headers of other Internet Protocol versions.

26. Thus, each of the "mish-mash of unrelated limitations to the network," including "carrying groups of data," a "specific format" for transmitting data, and "control, error control

and sequence information" referred to on page 5 of Plaintiff's Opening Claim Construction Brief is required by the Internet Protocol, and thus each of these limitations - in addition to many other specific requirements as illustrated in the header shown above - is also required by Plaintiff's construction because that construction is limited to Internet Protocol networks. Indeed, Plaintiff's construction is narrower than Defendants' because, for example, Defendants' construction only generally requires "error information" whereas Plaintiff's IP network construction requires a specific kind of error information and further requires that this information be contained in a field of a specific length.

27. Packet-based data networks other than IP networks were known at the time of the Barkan patents. For example, X.25 networks, which existed before the IP protocol was defined, are another type of packet-based data network that was widely known in the communications field at the time of the Barkan patents. X.25 networks, like IP networks, are packet-switched networks rather than circuit-switched networks. Ex. 2, Newton's Telecom Dictionary at 677 (definitions of X.25 and X.25 Network). Thus, even if "packet-based data networks" were construed to exclude circuit switched networks, X.25 networks would still qualify as "packet-based data networks" because they are both packet-based and packet-switched networks. Accordingly, a POSITA would not understand the term "packet-based data network" to be limited to IP networks.

B. "coordination center" ('284 claims 1-3, 5, 9, 12-13, 15-18, 20-21; '312 claims 2, 4, 8, 10, 17-18, 20, 23-24, 27, 29, 32-36, 39-40, 43-46, 49-53)

Defendants	Plaintiff
one or more computers that coordinates the operation of add-on base stations* and determines and disseminates a price policy to add-on base stations **The term "add-on base stations" rather than the term "gateway" used in the '284 patent and '312 patent claims is used to avoid*	"center that provides information over the packet-based data network required for making a call"

confusion with the term "remote gateway" that appears in certain '312 patent claims	

28. The term "coordination center" did not have a commonly understood meaning among those of ordinary skill in the art in the communications field, either at the time of the Barkan patents or today. It is not a term that is used in connection with any standard component of the GSM, UMTS, CDMA-2000 or LTE cellular systems, nor any other component of a cellular or other communications system that I can recall having encountered in my more than 30 years in the communications field. Even if this term is used somewhere in some document, it has no widely accepted meaning in the communications field.

29. A POSITA would understand the specification as confirming that the term "coordination center" is a new, coined term that does not refer to a known device or system because the Barkan patents consistently refer to the "coordination center" as something novel or new. E.g., Ex. A, '284 patent at 3:11-14; 6:21; 6:33-35; 6:52-53; and 7:31-32.

C. "route data" ('312 claims 14, 24, 35, 37, 40, 52, 54; '638 claims 1-2, 4, 7, 9-10, 12-15, 17, 20, 22, 25, 27, 30, 35-36)

Defendants	Plaintiff
select or determine the path that data will take	No construction necessary; plain and ordinary meaning applies. Alternatively: Send data to its destination.

30. The term "route," when used as a verb with the word data, has a well-established meaning in the communication field: selecting a path that data will take. In the context of packet-based data networks, data is divided into units referred to as packets and the network consists of network nodes connected by links. Thus, in the context of packet-based data networks, routing means selecting an outbound link, based on a set of rules, over which a

received packet will travel to its destination. This meaning is confirmed by Ex. J, Hargrave's Communications Dictionary at 449 (definition of the verb form of route).

31. In packet-based data networks, the links and nodes are typically selected by network devices known as routers. The job of a router is to receive an incoming packet and select a link over which a packet will travel to a next node along the path to the packet's destination. A router makes this selection on the basis of the destination address of the packet and a "routing table." A routing table is a map of destination addresses and outbound links over which packets with those destination addresses may be sent. Thus, when a router receives a packet, the packet uses the destination address to select one of a number of outbound links over which a received packet may be sent.

32. Different outbound links for different packets may be selected by the same router for the same destination address. There are several reasons for this, including, for example, that an outbound link previously unavailable becomes available or vice versa, or because of changing delays or traffic conditions on one or more outbound links. Because different outbound links can be selected for different packets having the same destination address, the packets can arrive at the destination address in an order different from which they were sent. If an application requires that it receive the packets in the order that they are sent from a peer application, the protocol layers above the IP layer are responsible for ensuring this occurs. For example, the Transmission Control Protocol (TCP) is a protocol located above the IP layer that ensures the packets are delivered in order and that no packets are missing.

33. When a router receives a packet that is larger than can be supported by an outgoing link, the router can divide the packet into multiple smaller parts referred to as fragments and send them. Because of this possibility, the IP header in IP networks includes a fragmentation field as discussed herein in connection with the "packet-based data network" term.

34. Routing errors can result in packets becoming lost. One example of a routing error that can occur after an equipment failure is known as a "routing loop." In routing loops, a packet travels between multiple routers in a loop. For example, router A selects an outbound link to router B, router B then selects an outbound link to router C, and router C then selects an outbound link to router A. In theory, the packet can get caught in this loop indefinitely. IP networks include a "TTL" or "time to live" field in headers of IP packets to prevent a packet from cycling in such a loop indefinitely.

35. I understand that Plaintiff asserts that "route" means "send to a destination." Those of skill in the art would immediately recognize that this is wrong. Routing is the process of selecting a path that the data will take. It is true that the data will need to be sent once that path is selected, and that a router will send data once the route is selected, but this does not mean that routing is the same thing as sending data. Any device on a network, including both routers and hosts (which can be a source of data, a consumer of data, or both), may send data over a link to another node on a network, but a host connected to a network via a single link does not route data. Ex. J, Hargrave's Communications Dictionary at 449 (definition of routing). Only a device such as a router that is connected to a network via multiple outbound links "routes" data by selecting one of those outbound links. The sending, or transmission, of that data over the selected outbound link is a separate process that occurs after the routing (i.e., the selection of a link) has been accomplished. Any use of the word "route" to mean simply sending/transmitting, without any path selection, is wrong and would be recognized as such by those of skill in the art.

36. The intrinsic record prior to the '638 patent also correctly distinguished between sending and routing at col. 4, lines 10-12 of the '284 patent, which discusses add-on base stations sending data, and packets becoming lost and arriving out of order, which happens during routing as discussed above.

D. "a controller adapted to regulate data flow" ('284 claims 1, 2, 4, 11)

Defendants	Plaintiff
means-plus-function (under *Williamson*) • Function "regulate data flow" ("regulate" means "to put or maintain in order") • Structure call controller 54, but there is insufficient disclosure of how the call controller 54 performs the claimed function	"Controller control[ling] access to the packet-based data network by the mobile device." Not a means-plus-function limitation. Alternatively, if construed as a means-plus-function term: Claimed function: regulate data flow Corresponding structure: Controller **54**, or equivalent

37. The claim term "a controller adapted to regulate data flow" neither connotes any form of structure to one of skill in the art in the context of the asserted patents, nor recites structure sufficient to perform the claimed function.

38. This term states that the "controller" is "adapted" to perform the function "regulate data flow." A POSITA would not understand the term controller to have any particular structure. Nothing about the function "regulate data flow" provides any additional context from which a particular structure could be identified.

39. "Regulate data flow" could refer to a wide variety of functions, even in the context of the claims. For example, "regulate data flow" might have something to do designating a specific host to which data is allowed to be sent and/or from which data is allowed to be received in a manner akin to what is known in the art as a firewall, or regulating the flow of data on the basis of payment information, or controlling the speed or amount of data flow depending on content type, along with a whole host of other possible regulating functions. Each of these could depend in some way on information received from a coordination center (e.g., subscription information concerning subscriber data rates and data limits, security information concerning unauthorized websites, content-type information, etc.).

40. Because the recited function "regulate data flow" could refer to a wide variety of functions, a wide variety of corresponding structures could correspond to the function.

Accordingly, the claim neither recites any sufficiently definite structure nor recites structure sufficient to perform the claimed function "regulate data flow."

41. I also note that the specification does not disclose any definite corresponding structure for this claim element. While the specification discloses a controller 54, the controller 54 is depicted as simply a black box, and the specification does not disclose any particular structure for the controller 54.

E. "connection regulator adapted to facilitate data flow" ('312 claims 1, 4, 8, 23, 39)

Defendants	Plaintiff
means-plus-function (under *Williamson*) • Function: "facilitate data flow" • Structure: No structure is linked to the claimed function in the specification. To the extent that anything in the specification might correspond to the claimed function, it appears to be "channel electronic means 53" which is referred to as "circuits for connecting" in the Abstract, but no structure is disclosed for the "channel electronic means 53" or the "circuits for connecting."	No construction necessary; plain and ordinary meaning applies. Not a means-plus-function limitation. <u>Alternatively</u>: a controller adapted to enable data flow and control access. Alternatively, if construed as a means-plus-function term: Claimed function: facilitate data flow Corresponding structure: controller **54**, or equivalent

42. The term "connection regulator" had no known meaning and did not connote any form of structure or class of structures, to one of one of ordinary skill in the art at the time of the alleged invention of the Asserted Patents.

43. There are instances in which the term "regulator" can refer to a certain structure or class of structures when used with certain terms. An example is a "voltage regulator" in the context of electrical circuits. A POSITA in the field of communications would not understand "connection regulator" to be one of these types of terms because a POSITA would not associate any known structure with a "connection regulator." In my more than 30 years in the field of communications, I cannot recall ever having encountered this term in that context.

44. The function recited by the claim, "facilitate data flow," also does not connote any particular structure or class of structures when associated with a "connection regulator." Like the function "regulate data flow," the function "facilitate data flow" could refer to a wide variety of functions. I note that claim 1 of the '284 patent recites this identical function in connection with an interface: "a first interface adapted to facilitate data flow between the mobile device and the data network." Ex. A, '284 patent at 17:17-18. Thus, facilitating can refer to some function performed by an interface, and could also refer to hardware or software functions necessary to enable data to flow between interfaces, i.e., between the claimed transceiver and the claimed connector to the packet-based data network, such as providing a routing function, authenticating a mobile device, or allowing a mobile device to use the base station on the basis of subscription information. Again, these functions can all depend or make use of data from a coordination center in a variety of ways.

F. "public Internet" ('312: claims 15-18, 21, 25-27, 30-31, 41-43, 47-48; '638: claims 1-2, 4-6, 9-10, 12-14, 17, 20, 22-24, 27, 30, 32-34, 36)

Defendants	Plaintiff
network formed by devices that are assigned public IP addresses	No construction necessary; plain and ordinary meaning applies.

45. When the term "Internet" is capitalized, it is generally used in the art to refer to the world-wide communications network (or system of networks) that connects computers around the world. This understanding is reinforced by the use of the word "public" that precedes the capitalized Internet in some '638 and '312 patent claims. In contrast, the term "internet" with a lower case "i" is typically used to refer to any network, public or private, that conforms to the Internet Protocol.

46. The public Internet includes hosts that send or receive data, as well as routers and links over which packets travel between hosts. As discussed in connection with the "route data"

term above, routers select links over which a packet will travel based on the destination IP address of the packet and a routing tables maintained by the routers. Ex. M, Severance at 35-39.

47. IP addresses, including both source IP addresses and destination IP addresses, are either public IP addresses or private IP addresses. Public IP addresses, also sometimes referred to as unique IP addresses, are unique addresses assigned via a hierarchical system headed by ICANN (Internet Corporation for Assigned Names and Numbers). Ex. K, Beginner's Guide at 6. Public addresses allow packets to be routed to or from anywhere across the entire public Internet. *Id*. at 4.

48. In contrast to public IP addresses, ICANN specifically reserves certain address ranges known as private IP addresses for use only on "private networks, such as many home and office networks." *Id*.; *see also* Ex. M, Severance at 47-48. Examples of private IP addresses are IP addresses that begin with the prefix 192.168.yyy.zzz, 172.16.0.0 – 172.31.255.255, or 10.xxx.yyy.zzz. *Id*.; *see also* Beginner's Guide at 4. For example, many home routers, including a wireless router in my home, have the address 192.168.1.1. The addresses 192.168.1.0 and 10.0.1.1 are also often assigned to home routers.

49. Private IP addresses are sometimes called "non-routable," which means that they cannot be used as addresses to route data over the public Internet. Ex. M, Severance at 47.

50. These address allocations are consistent with the description of add-on base stations in the specifications of the Barkan '312 and '638 patents. The specification describes that an add-on base station can receive an incoming call when the coordination center provides its IP address to another add-on base station that initiates a call. '312 patent at 12:45-13:17. This functionality will only work over the public Internet if such an add-on base station has a public rather than a private IP address. This is because a device – whether it be an add-on base station or any other computer – with a private IP address cannot receive packets directly from the

public Internet. Data packets from the public Internet must pass through a device that performs Network Address Translation, or NAT. NAT is often performed by devices that act as gateways between two networks, such as the public Internet and a private LAN. Many home routers also act as gateways and perform NAT between the public Internet and the private LAN they serve.

51. For example, when an incoming voice over IP (VoIP) packet (*see*, *e.g.*, the '638 patent at 4:9-14) sent from an add-on base station is received at a NAT gateway from the public Internet, the destination address in the packet is the public IP address of the gateway (this is the only way for the routers on the public Internet to route the packet to the gateway). In order for the gateway to send the received packet to a device with a private IP address on its private LAN, such as an add-on base station, the gateway needs to change the destination address of the packet from its public IP address to the private IP address of the add-on base station. However, because the private LAN may have multiple devices, each with its own distinct (on that private LAN) private IP address, the gateway will not know which of these multiple private IP addresses on the LAN to use without some additional information.

52. The solution to this problem was not recognized in the art at the time of the Barkan patents, and, at that time, it was generally understood that IP communication initiated by a device outside a private LAN, such as a device on the public Internet, to a device with a private IP address on a private LAN was precluded. This problem was not solved until years after the claimed priority date of the Barkan patents by the use of techniques such as those described in Ex. 15 (U.S. Patent No. 8,018,877) and Ex. 16 (IETF Internet Draft entitled "Traversal Using Relay NAT (TURN)" dated November 14, 2001).

53. The 8,018,877 (the "'877 Patent") patent discloses a "server-based architecture for mobile conferencing … established by transmitting necessary server network address information through page-mode based messaging services to establish connection among the

various mobile devices with the server." '877 Patent at Abstract. In other words, the "additional information" needed for one or more mobiles that have a private IP address to communicate with a conference server located on the public Internet would be the server's IP address and a specific port number for each conference. This "additional information" would be supplied to each mobile invited to the conference via a messaging service, e.g., a Short Message Service message (SMS, aka a text message). *See e.g.*, 2:4-18, 4:39-46, Fig. 2 and its associated text.

54. The TURN Draft defines an additional server that it refers to as a "TURN server" that is used to create an association between a client located on the private side of a NAT router with any other host located on the public Internet so they can communicate data in both directions via the TURN server. *See e.g.*, Ex. 16, TURN Draft p. 2.

55. The Barkan patents do not describe any technique similar to the techniques described in these documents for allowing a device with a private IP address that is located on a private LAN behind a NAT device to receive a message initiated by a device outside the private LAN. Instead, the Barkan patents only describe that the coordination center provides the IP address of an add-on base station that is to receive a call. As a result, a POSITA would understand the discussion of IP addresses in the Barkan patents to be referring to only public IP addresses. Otherwise, the techniques described in the Barkan patents that allow a call to be received by a mobile phone in RF communication with an add-on base station would simply not work.

56. I note the assertion at page 17 of Plaintiff's Opening Claim Construction Brief that construing "'public Internet' to mean 'a-network-formed-by-devices-that-are-assigned-public-IP-addresses' would appear to be inconsistent with the preferred embodiment of the Patents-in-Suit." A POSITA would understand that this statement is simply wrong because it is entirely possible for a home device, in addition to the typical router, to have a public IP address.

Indeed, in the past, I myself had a server in my home that had a public IP address. Most Internet Service Providers will happily provide a public IP address to a homeowner. Defendants' construction is therefore entirely consistent with all embodiments of the Patents-in-Suit (but Plaintiff's construction is not for the reasons discussed above).

57. I also note that Plaintiff's Opening Claim Construction Brief seems to imply, without explicitly saying so, that the construction of "public Internet" must be broad enough to read on a device with a private IP address on a private LAN. Simply put, any construction that would read on such a device would be recognized as wrong by those of ordinary skill in the art because those of skill in the art recognize that such devices are private, not public. Indeed, private addresses are explicitly reserved for use on private networks by ICANN as discussed above.

G. "tamper-free unit"/"tamper free hardware" ('638 claims 1, 9, 18, 28; '312 claim 13)

Defendants	Plaintiff
unit/hardware that includes means to destroy its contents or delete information stored therein, if someone tries to tamper with it	Mechanism designed to prevent or inhibit tampering Hardware designed to prevent or inhibit tampering

58. The terms "tamper-free unit" and "tamper-free hardware" were not terms of art and had no commonly accepted meaning in the art at the time of the alleged invention of the Asserted Patents.

59. The term "tampering" and related terms such as "tamper-resistant" are known in the art, but even for those terms there is no generally accepted understanding among those of ordinary skill in the art as to what such terms mean. For example, some might consider a ROM (read only memory) as being a tamper-resistant memory, because the contents of a ROM cannot be altered. However, others would not consider a ROM to be tamper-resistant, particularly in the

field of cryptography, because a ROM does not prevent its contents from being read and thus would not resist tampering in the form of discovering a secret encryption key stored in the ROM.

60. The apparently narrower term "tamper-free" is also unclear and perhaps more so because, in addition to the uncertainty associated with terms like "tamper-resistant," it is not clear to one of ordinary skill in the art as to whether the term "tamper-free" is intended to connote something more than tamper-resistant.

61. I have been informed and understand that the meaning of claim terms that have no plain and ordinary meaning in the art must be found in the patent, and cannot be broader than what is described in the patent. The specification discusses "tamper-free" in only one place, in the context of a "black box":

> The billing unit can be a "black box" inside each apparatus. This black box can be tamper-free, including means to destroy its contents or delete the information therein, if someone tries to tamper with it. This ensures that it can be trusted to work under commands given in policy documents.

'312 patent at 10:47-51.

62. A POSITA reading this would understand the term "black box" to refer to a generic abstraction, typically representing hardware or a combination of hardware and software that performs a given function. In other words, a POSITA would understand a "black box" to not literally mean a physical box that is black in color. The specification states that the "black box" in this example is a billing unit. *Id.* It goes on to say the black box can be "tamper-free, including means to destroy its contents or delete the information therein, if someone tries to tamper with it." *Id.* at 10:48-50. Thus, on the basis of how this term is used in the specification, the meaning of "tamper-free unit" and "tamper-free hardware" must be a unit or hardware that includes at least the ability to destroy its contents or delete information if tampering is detected.

63. The Plaintiff's Opening Claim Construction Brief also asserts that a "black box" structure is itself an example of "tamper-free" hardware. I disagree with this statement. First, it is not clear what is meant by a "black box" structure; the term "black box," without modification, is typically used in a generic sense. However, regardless of what this term might mean, the specification nowhere describes a "black box" structure as being "tamper-free" other than in the case where that black box structure includes the ability to destroy its contents or delete the information therein as discussed at 10:41-44 of the '312 patent. Indeed, the statement that the "black box ***can*** be tamper-free" is itself a clear indication that a "black box" structure may not be "tamper-free" absent means to destroy its contents or delete the information therein, if someone tries to tamper with it.

64. As Plaintiff notes, the word "tampering" (but not tamper-free) also appears in the context of the encryption of digital documents "so as to prevent tampering with." *See* '312 patent at 6:30-31. I disagree with Plaintiff's characterization of this passage to broaden the meaning of "tamper free unit" and "tamper-free hardware" because it is used in a different context compared to the claim language. The claim terms relate to physical devices, but this passage relates to the dissemination (i.e., transmission) of non-physical digital information that has been encrypted.

H. "transmission power lower than transmission power of conventional base station" ('638: claims 1, 9)

Defendants	Plaintiff
Indefinite	No construction necessary; plain and ordinary meaning applies. Alternatively: transmission power lower than the transmission power of a cellular-frequency macrocell site

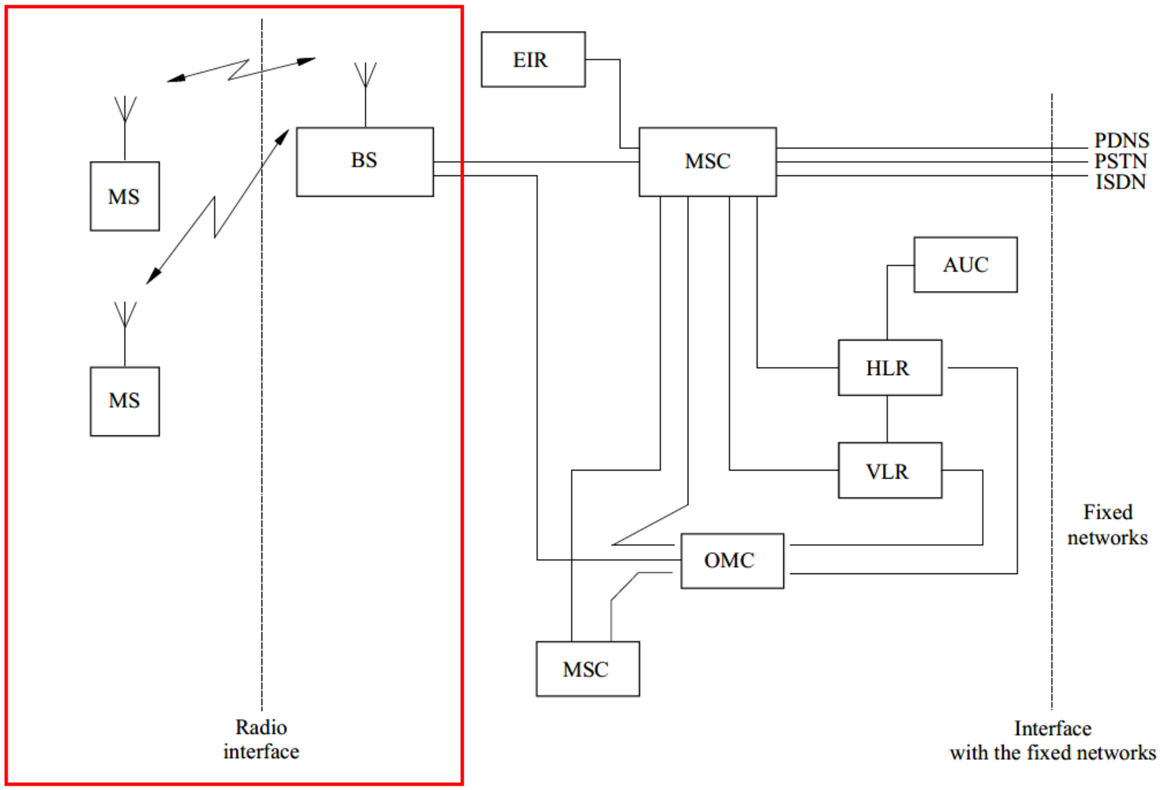
65. I have been informed and understand that a claim is indefinite if it does not inform a POSITA with reasonable certainty as to the scope of the claimed invention. Here, the claimed add-on base station's transmission power is defined by the transmission power of a

"conventional" base station. However, as I explain below, there was no commonly accepted or understood notion in the art of a "conventional" base station's transmission power at the time of the alleged invention of the Asserted Patents. To the contrary, "conventional" base stations transmitted with a wide variety of transmission powers. Thus, this claim limitation is indefinite because it does not allow a POSITA to determine with reasonable certainty what transmission power is within the scope of the claim.

66. For example, Recommendation ITU-R M.1073-1, which was in effect between 1994 and 1997, summarized the technical and operational characteristics of digital cellular land mobile telecommunication systems. Ex. 4, Recommendation ITU-R M.1073-1 (1994-1997) at 1. The International Telecommunication Union (ITU) is responsible for allocating global radio spectrum, satellite orbits and standards to ensure networks seamlessly interconnect with each other. Figure 1 of this document provides an overview of the basic pieces of a typical cellular communications network, including a base station (BS) that communicates with mobile stations (MS, i.e., cell phones) over a radio interface, which I highlighted in the red box, below. The figure shows the "general characteristics" of a typical cellular communications network architecture of that era. *Id.* at 3.

FIGURE 1

Network architecture



AUC: authentication centre
BS: base station
EIR: equipment identity register
HLR: home location register
MS: mobile station
MSC: mobile services switching centre
OMC: operation and maintenance centre
VLR: visitor location register

—— Physical connection

—— Logical relationships

1073-01

Id. at 4.

67. However, although it was generally understood by those in the art at the time that base stations were basic components of a cellular communication system, there was no general understanding of what a base station's "transmission power" would have been. Table 1 of Recommendation ITU-R M.1073-1 lists various "Core parameters" of various types of digital

cellular networks technologies. The last row on page 5 lists the maximum base station e.r.p. (effective radiated power) in Watts for these various systems (annotated in red below).

TABLE 1

Core parameters

Feature	GSM 900/ DCS 1 800/ PCS 1 900	North American D-AMPS (800 MHz 1.8 GHz)	North American CDMA (800 MHz 1.8 GHz)	Japan PDC	Composite CDMA/TDMA	PACS licensed	Wideband CDMA
Class of emission							
– traffic channels	271KF7W	40K0G7WDT	1250K0B1W	32K0G7WDE	5000KF7W	300KF7W	5000K0B1W
– control channels	271KF7W	40K0G1D	1250K0B1W	32K0G1D	5000KF7W	300KF7W	5000K0B1W
Transmit frequency bands (MHz)							
– base stations	935-960 (GSM) 1 805-1 880 (DCS) 1 930 -1 990 (PCS)	869-894 (800 MHz) 1 930-1 990 (1.8 GHz)	869-894 (800 MHz) 1 930-1 990 (1.8 GHz)	810-826 1 477-1 501	1 850-1 990	1 930-1 990	1 930-1 990
– mobile stations	890-915 (GSM) 1 710-1 785 (DCS) 1 850-1 910 (PCS)	824-849 (800 MHz) 1 850-1 910 (1.8 GHz)	824-849 (800 MHz) 1 850-1 910 (1.8 GHz)	940-956 1 429-1 453	1 850-1 990	1 850-1 910	1 850-1 910
Duplex separation (MHz)	45 (GSM) 95 (DCS) 80 (PCS)	45 (800 MHz) 80 (1.8 GHz)	45 (800 MHz) 80 (1.8 GHz)	130 (0.9 GHz) 48 (1.5 GHz)	0	80	80
RF carrier spacing (kHz)	200	30	1 250	25 interleaved 50	5 000	300 Interleaving at 100 kHz	5 000
Total number of RF duplex channels	124 (GSM) 374 (DCS) 299 (PCS)	832 (800 MHz) 1 985(1.8 GHz)	20 (800 MHz) 47 (1.8 GHz)	640 (0.9 GHz) 960 (1.5 GHz)	28	256	12
Maximum base station e.r.p. (W)							
– peak RF carrier	300 (GSM) 20 (DCS) 1 000 (PCS)	300 (800 MHz) 1 000 (1.8 GHz)	Not specified (800 MHz) 1 034 (1.8 GHz)	Not specified	Not specified	0.8	Not specified

Rec. ITU-R M.1073-1

Id. at 5 (annotated). As shown above, the maximum base station transmission powers for the different cellular systems vary widely, and for certain well-known systems like North American CDMA, there was *no specified* effective maximum power for the base stations. *Id.* Moreover, there are no specified *minimum* base station transmission powers listed. There is no stated minimum power for these base stations because it is a well-known concept that a base station should use no more power than necessary in order to minimize the amount of system interference. Thus, there is no specific power floor defined for these base stations so there is no value with which to compare this claim term.

68. The variance for a GSM (second generation cellular standard—2G) base station's transmission power was actually even greater than summarized in Table 1 of Recommendation ITU-R M.1073-1. In the Draft GSM 05.05 v.8.0.0 specification, dated July 1999 (Ex. 5), the maximum output powers of various base station power classes are summarized on page 14. For

example, depending on the transmitter power class, the GSM 400 and GSM 900 transmitters ranged in maximum output power from 2.5 W to 640 W. *Id.* If we include GSM 900 micro- and pico-base stations, the variance extends even further down to 13 dBm (about 0.02 W) to 24 dBm (about 0.2512 W). *Id.* Thus, in GSM 400 and 900 networks at the time of the purported invention of the Asserted Patents, the "transmission power of a conventional base station" may potentially represent a range of possible transmission powers in which the highest maximum nominal transmission power (640 W) was about 32,000 times greater than the lowest maximum nominal transmission power (0.02 W). *See id.*

69. The wide variance in transmission power reflects in part the different conditions in which base stations are expected to operate. For instance, cellular carriers must design their networks to accommodate densely populated urban areas (known as metropolitan service areas or MSAs) in which many base stations are placed relatively close together to provide adequate coverage. But carriers must also design networks to accommodate rural service areas (RSAs), which tend to have a lower density of users and thus call for base stations to be spaced farther apart and operate at higher power settings . *See, e.g.,* Ex. 17, Mehotra, *Cellular Radio*: Analog and Digital Systems (1994) at 64, 66-69; Ex. 18, Lee & Miller, *CDMA Systems Engineering Handbook* (1998) at 297 (depicting the density of cells as proportionate to the density of subscribers).

70. Because the transmission power of "conventional" base stations provides such an unreliable ruler by which to measure the scope of this limitation, it is my opinion that this limitation is indefinite.

I. "produces a cell smaller than macrocells of conventional base stations" ('638: claims 1, 9)

Defendants	Plaintiff
Indefinite	No construction necessary; plain and ordinary meaning applies. Alternatively: produces a cellular signal that extends a distance

	which is less than the distance of the cellular signal produced by a cellular macrocell site.

71. Like the previous term regarding transmission power, this term is indefinite because it is defined in terms of a purported limit – the size of the "macrocells of conventional base stations—which provides no guidance about the scope of the invention because there was no commonly accepted or understood notion of a "conventional" macrocell size in the art at the time of the alleged invention of the Asserted Patents.

72. As discussed above, macrocell size is related to transmission power. *See, e.g.,* Ex. 17, Mehotra, *Cellular Radio*: Analog and Digital Systems (1994) at 64, 66-69. Accordingly, as with transmission power, there has always been a broad range of macrocell sizes in digital cellular communications networks, at least at the time of the purported invention. This is reflected, for example, in the highlighted row summarizing cell radii as provided in of Table 1 of Recommendation ITU-R M.1073-1:

TABLE 1 (*continued*)

Feature	GSM 900/ DCS 1 800/ PCS 1 900	North American D-AMPS (800 MHz 1.8 GHz)	North American CDMA (800 MHz 1.8 GHz)	Japan PDC	Composite CDMA/TDMA	PACS licensed	Wideband CDMA
Nominal mobile station transmit power (W)	8, 1.0 (GSM) 1, 0.125 (DCS/PCS)	9, 3 0.006, 0.0004	0.2, 0.01	3	0.6, 0.0093	0.2, 0.025	–, 0.25
Peak value, average	5, 0.625 (GSM) 0.25, 0.031 (DCS/PCS) 2, 0.25 (GSM) 0.8, 0.1 (GSM) 2, 0.25 (PCS)	4.8, 1.6 1.0, 0.6, 0.33, 0.002 1.8, 0.6 To be defined		2 0.8 0.3			
Cell radius (km)							
– minimum	0.5	0.5	Not specified	0.5	0.1	< 0.1	Not specified
– maximum	35	20	50	20 (up to 60)	10	1.6	20
Access method	TDMA	TDMA	CDMA	TDMA	TDMA/CDMA	TDMA	CDMA
Traffic channels/RF carrier							
– initial	8	3	61	3	32	8	125
– design capability	16	6	122	6	64	32	253
Modulation	GMSK (BT = 0.3)*f*	π/4 differentially encoded QPSK (roll-off = 0.35)	QPSK (spreading) BPSK (outbound); 64-ary orthogonal (inbound)	π/4 shifted QPSK (roll-off = 0.5, root Nyquist filter)	SEQAM	π/4 DQPSK	QPSK (data modulating) BPSK (spreading)
Transmission rate (kbit/s)	270.833	48.6	9.6 or 14.4 per channel up to 921.6 per carrier	42	781.25	384	64

Rec. ITU-R M.1073-1

Ex. 4, Recommendation ITU-R M.1073-1 at 6 (annotated). As shown above, the macrocell sizes in the GSM/DCS/PCS systems ranged from a minimum of 0.5 km to a maximum 35 km, and the

macrocell sizes in Composite CDMA/TDMA systems ranged from a minimum of 100 m to a maximum of 10 k. *Id*. Other systems, like North American CDMA and Wideband CDMA, have *no specified lower limit* in macrocell size and a maximum radius of 50 km and 20 km, respectively. *Id.*

73. In addition, as discussed above with respect to transmission power, macrocell sizes also varied based on geography and population density. For example, in cities, the "conventional size cells" in TDMA networks ranged from "500 m to 2km across" as of 1999. Ex. 6, Coombs and Steele, *Introducing Microcells into Macrocellular Networks: A Case Study*, IEEE Transactions on Communications, Vol. 47, No. 4, at 568 (Apr. 1999).

74. Essentially, macrocell sizes of "conventional" base stations varied widely, from many kilometers on the high end to 100 m (or potentially arbitrarily small, as in the case of North American CDMA). Thus, based on the claim language and its context in the specification, a person of ordinary skill in the art would not be able to determine the bounds of this claim limitation because the metric used in the limitation - the size of "conventional" macrocells - provides no reasonable or reliable guidance by which to measure the boundaries of this claim. Therefore, it is my opinion that this limitation is indefinite.

J. "unique identity bound to a cryptographic key" ('312 claims 8, 39)

Defendants	Plaintiff
unique identity and a cryptographic key included in a certificate issued by a certifying authority	No construction necessary. Alternatively, "unique identity associated with a cryptographic key"

75. Defendants' construction reflects the ordinary meaning of this claim phrase to a POSITA at the time of the Barkan patents because, in the field of cryptography, cryptographic keys are bound to unique identities by a certificate issued by a certifying authority.

76. I note that this understanding is reflected in the specification of the '312 patent. The specification explains that "[e]ach phone, base station and the cellular center 3 may have their own digital certificate, which binds a cryptographic public key, with an identifier." Ex. B ('312 patent) at 8:15-17. The patent explains the purpose of binding the cryptographic key with the unique identity: "[i]n this way the packets of voice originating from the phone, can be encrypted by the destination public key to the other phone, ensuring privacy." *Id.* at 8:21-23. A POSITA would understand that the reason a certificate is used in connection with a public key is to enable the sender to ensure that a public key being used to encrypt an outgoing message is the correct public key that corresponds to the private key of the entity to which the message is directed, rather than a public key of some undesired third party, and that the certificate must come from a trustworthy third party certifying authority in order to fulfill this purpose. Ex. M (Severance) at 94-95.

77. This ordinary meaning to a POSITA is also reflected in prior and contemporaneous patents and patent publications that specifically use the word "bind." Ex. 7 at 3:26-28; Ex. 8 at 2:29-31; Ex. 9 at 25:26-33; and Ex. 10 at ¶ [0013].

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

This declaration was executed on December 21, 2018, at Greenville, Texas.

By: Mark Lanning

Mark Lanning